Graphics and Media State of the Union

Session 200

These are confidential sessions—please refrain from filming or taking pictures.

Graphics and Media

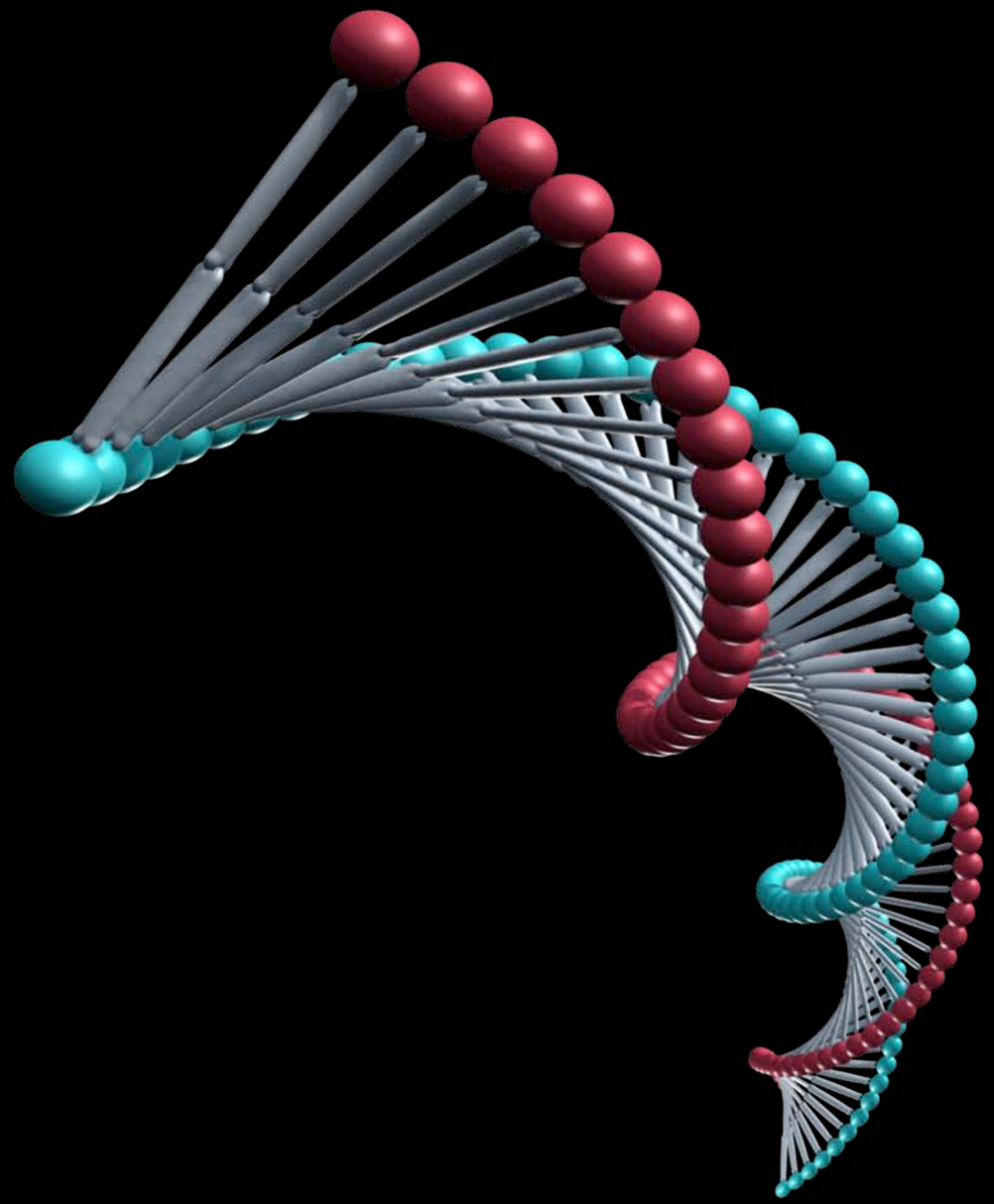
Mac OS X Tiger

Mac OS X Graphics and Media

Audio	2D	3D	Imaging	Video
Pro-grade audio technology	The ultimate 2D graphics platform	Hardware-accelerated 3D graphics	State-of-the-art image processing	Leading the revolution in digital media

Super Fast

Integrated by Design



Simple to Use

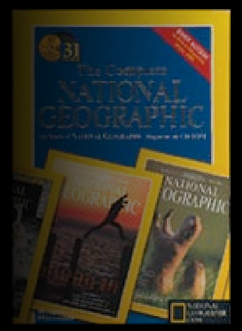
Future

Proof

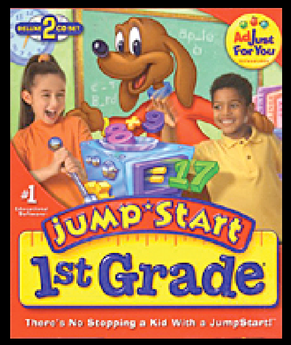
Mac OS X Tiger

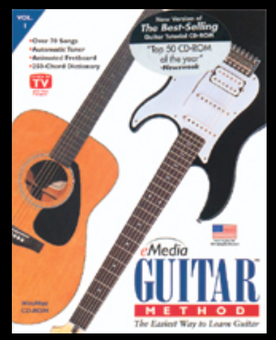
QuickTime

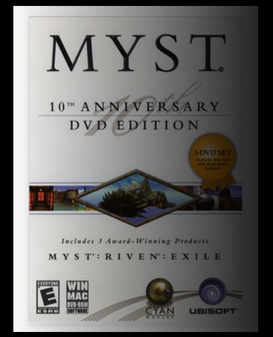
http://developer.apple.com/wwdc2005/

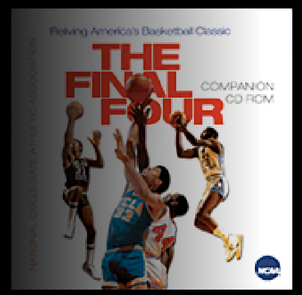

The Complete
NATIONAL GEOGRAPHIC

Transparent Language
#1
Learn
ITALIAN
Now!
Language learning software that really works. Guaranteed!


Ad Just For You
JumpStart
1st Grade
There's No Stopping a Kid With a JumpStart!

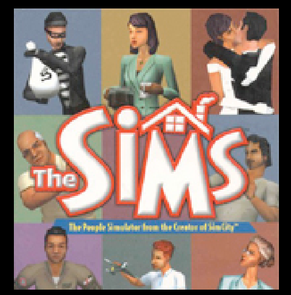

eMedia
GUITAR
METHOD
The Easiest Way to Learn Guitar


MYST
10TH ANNIVERSARY
DVD EDITION
MYST · RIVEN · EXILE
CYAN
UBISOFT


Reliving America's Basketball Classic
THE FINAL FOUR
COMPANION CD ROM
NCAA

DoCoMo
ドコモCD-ROMカタログ

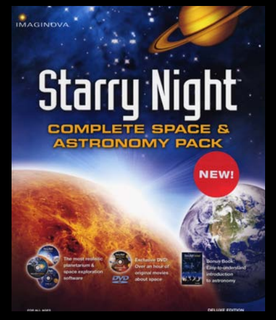
barry bonds
CYBERACTION


The SIMS
The People Simulator from the Creator of SimCity

SHEEP

LEXUS IS300

MYTH III
THE WOLF AGE
MacSoft


IMAGINOVA
Starry Night
COMPLETE SPACE & ASTRONOMY PACK
NEW!

Barbie
The Princess and the Pauper
PC CD-ROM

Reflections

> 4000 Titles

> 400M Downloads

Way Beyond the PC

QuickTime 7

http://developer.apple.com/wwdc2005/

Breakthrough Video Quality

H.264

Scalable from 3G to HD and beyond

1920x1080 HD
@ 7-8 Mbps

1280x720 HD
@ 5-6 Mbps

640x480 SD
@ 1-2 Mbps

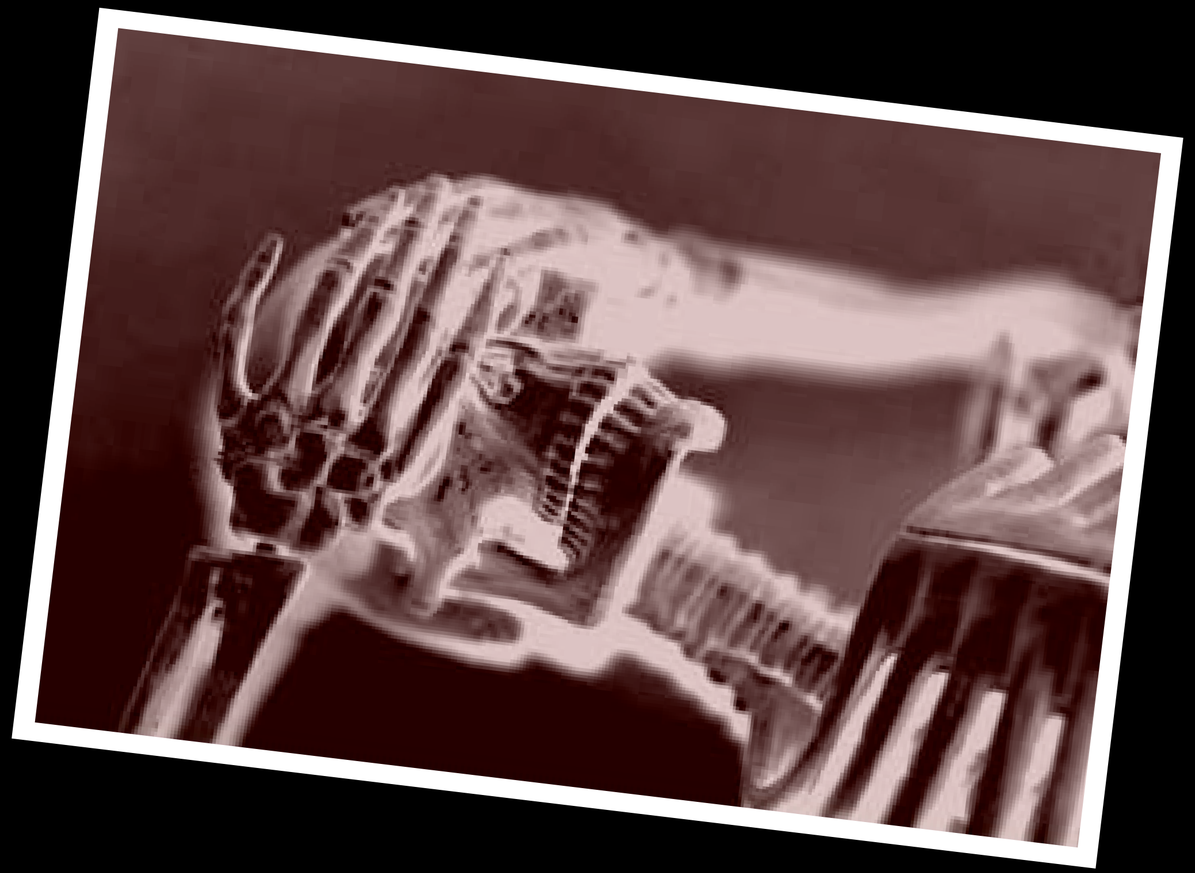
176x144 3G
@ 50-160 Kbps

H.264 Wins

Standards Bodies	Broadcasters	DSP Technology	Encoders	Telecom
3GPP	DirecTV	Intel	Apple Computer	Polycom
ISO/MPEG	Top 6 Japanese broadcasters	Broadcom	Thompson/ Grass Valley	Tandberg
ITU-T	Voom	Texas Instruments	Scientific Atlanta	Sony
HD DVD	BSkyB	Phillips	LSI Logic	Nokia
Blu-ray	Euro1080	Siemens	Samsung	Qualcomm
DVB (Europe)	Premiere Fernsehen AG (Germany)	Toshiba	Harmonic	British Telecom
DMB (Korea)	France	DSP Research	TandbergTV	Sanyo
ATSC (US) Pending		Mitsubishi	Envivio	Deutsche Telekom

This Ain't Your Mother's Codec

- Massively more complex picture and bitstream structure
- Edits require much more sophisticated logic
- Your editing APIs remain simple and intuitive



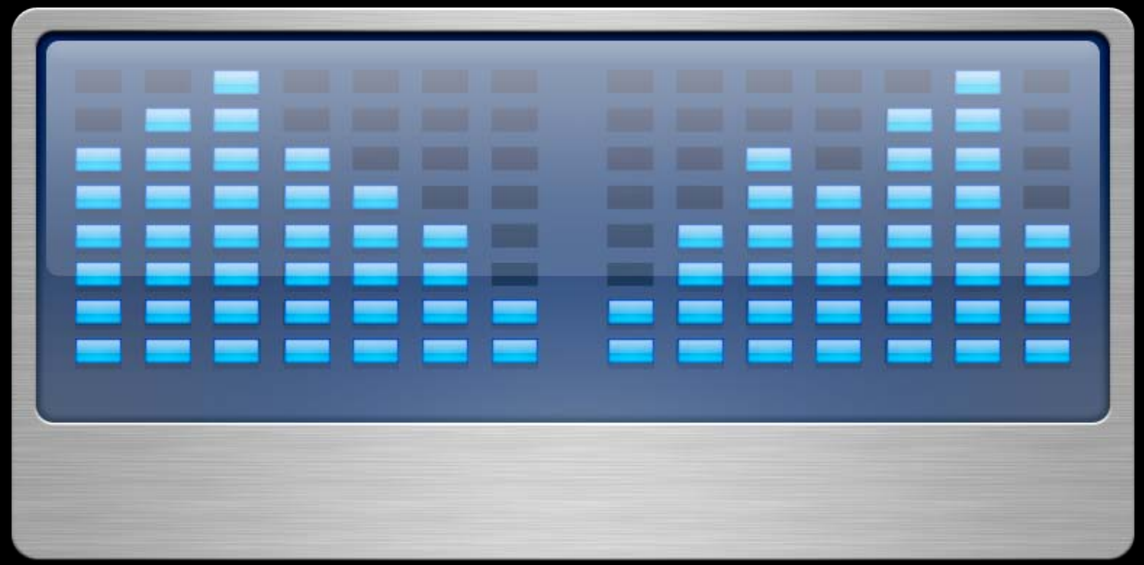
We had the headaches
so you don't have to!

Supporting Advanced Video Formats

Session 208
Wednesday 2:00PM

High-Definition Audio

- QuickTime directly layered on Core Audio
- Supports many surround audio formats
- Sample rates up to 192 kHz
- Sample resolutions to 24-bit and beyond
- Sample-accurate multichannel sync

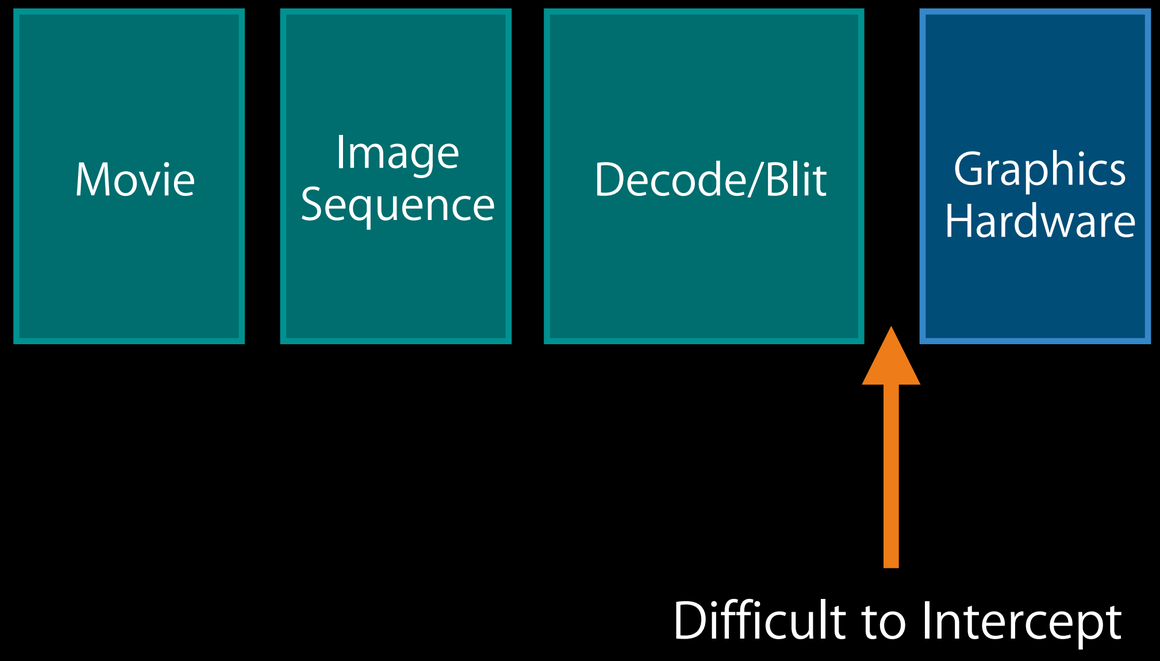


Harnessing the Audio Capabilities of QuickTime 7

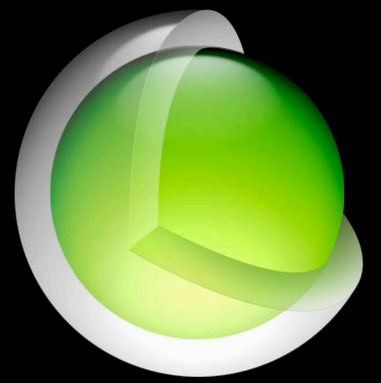
Session 201
Tuesday 10:30AM

Challenge: Video on a Texture

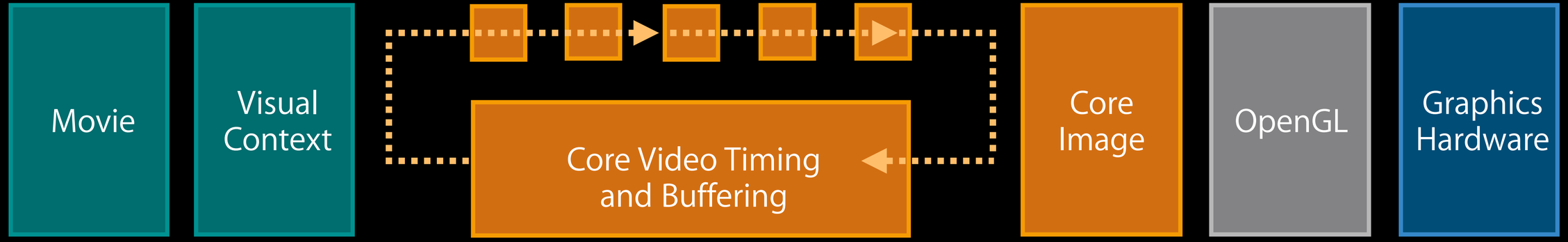
- One of the most common requests
- One of the hardest techniques to pull off



Solution: Core Video



- Split picture decode and picture display into two steps
- Low-level, ultra-high performance display blitting
- HW-accelerated compositing
- Integration point for Core Image and other OpenGL processing



Demo

Video on a Texture

http://developer.apple.com/wwdc2005/

Cocoa and QuickTime

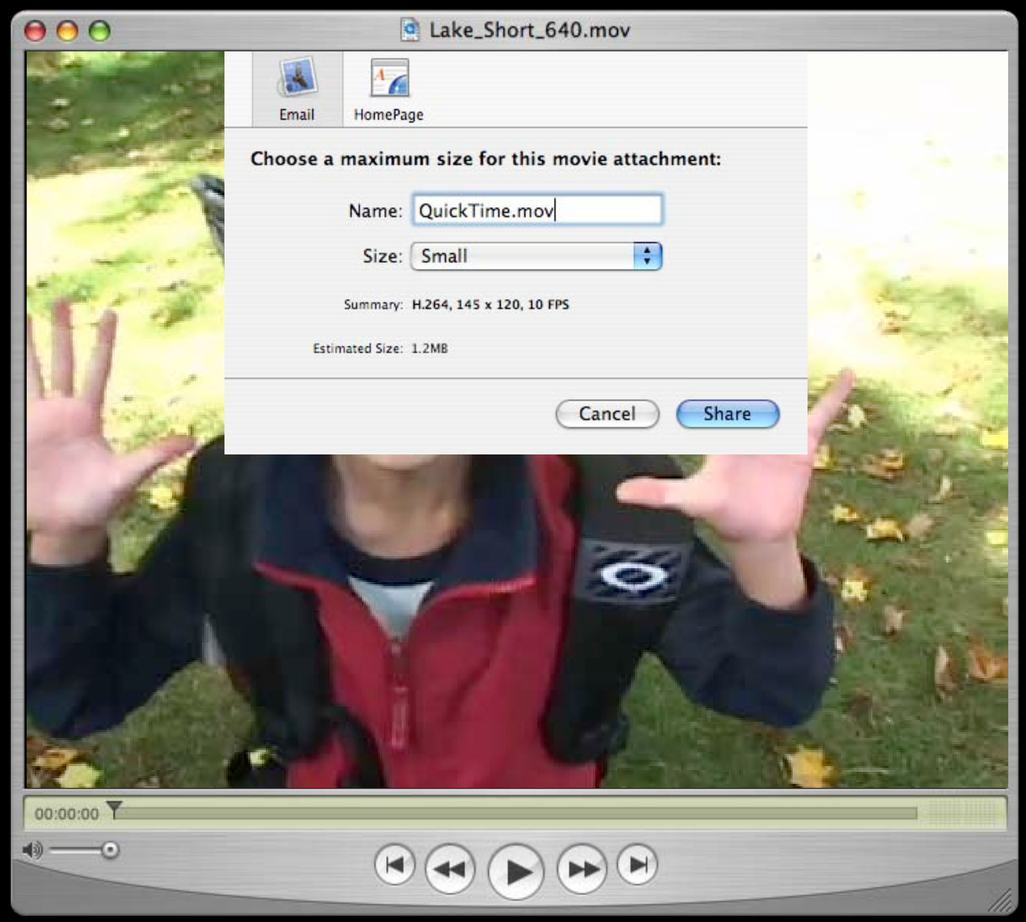
- Make QuickTime more accessible for Cocoa developers
- Access to no-compromise, high-performance media operations
- Wrapped in a tasty, crunchy coating

Application Programming with QTKit

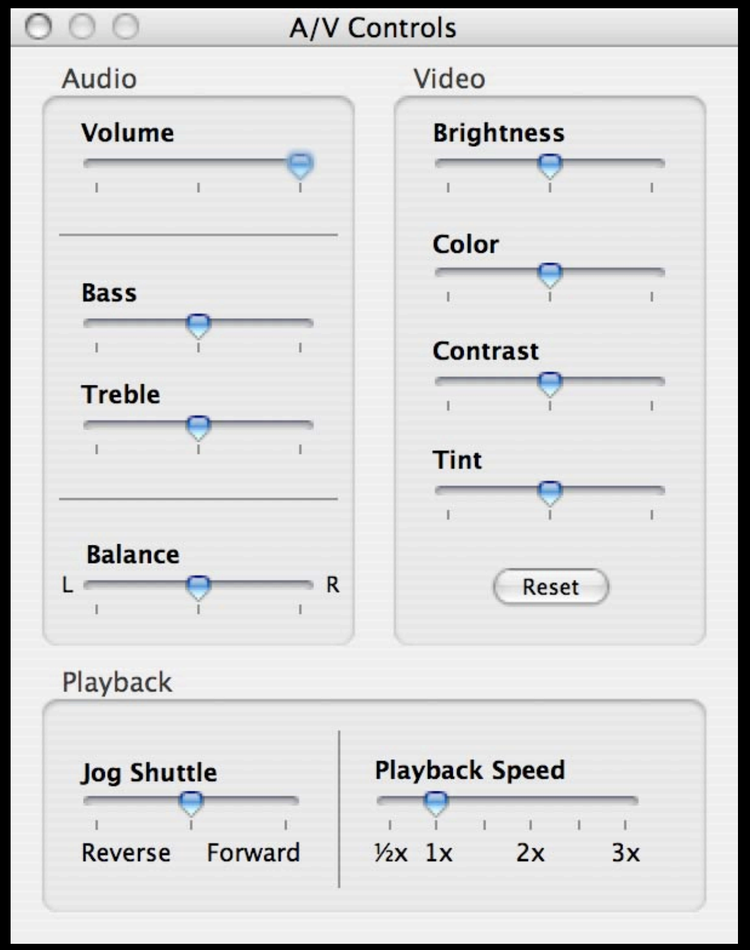
Session 211
Wednesday 3:30PM

Brand New Player

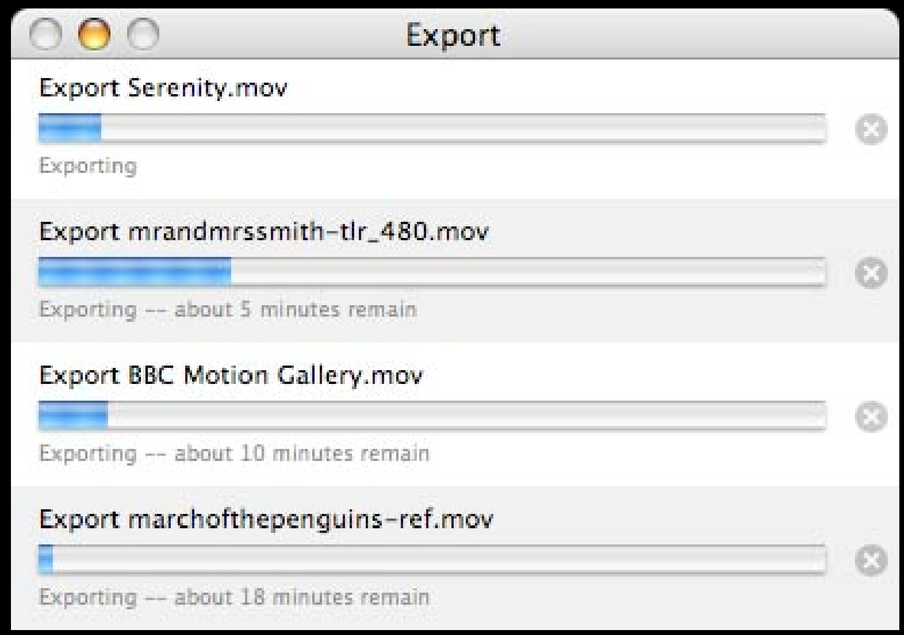
Easy Movie Recording



Movie Sharing



New A/V Controls



Concurrent Export

New Full-Screen Controls

But Don’t Take My Word for It…

QTKit in Action

Dr. Michael B. Johnson
Moving Pictures Group Lead
Pixar Animation Studios

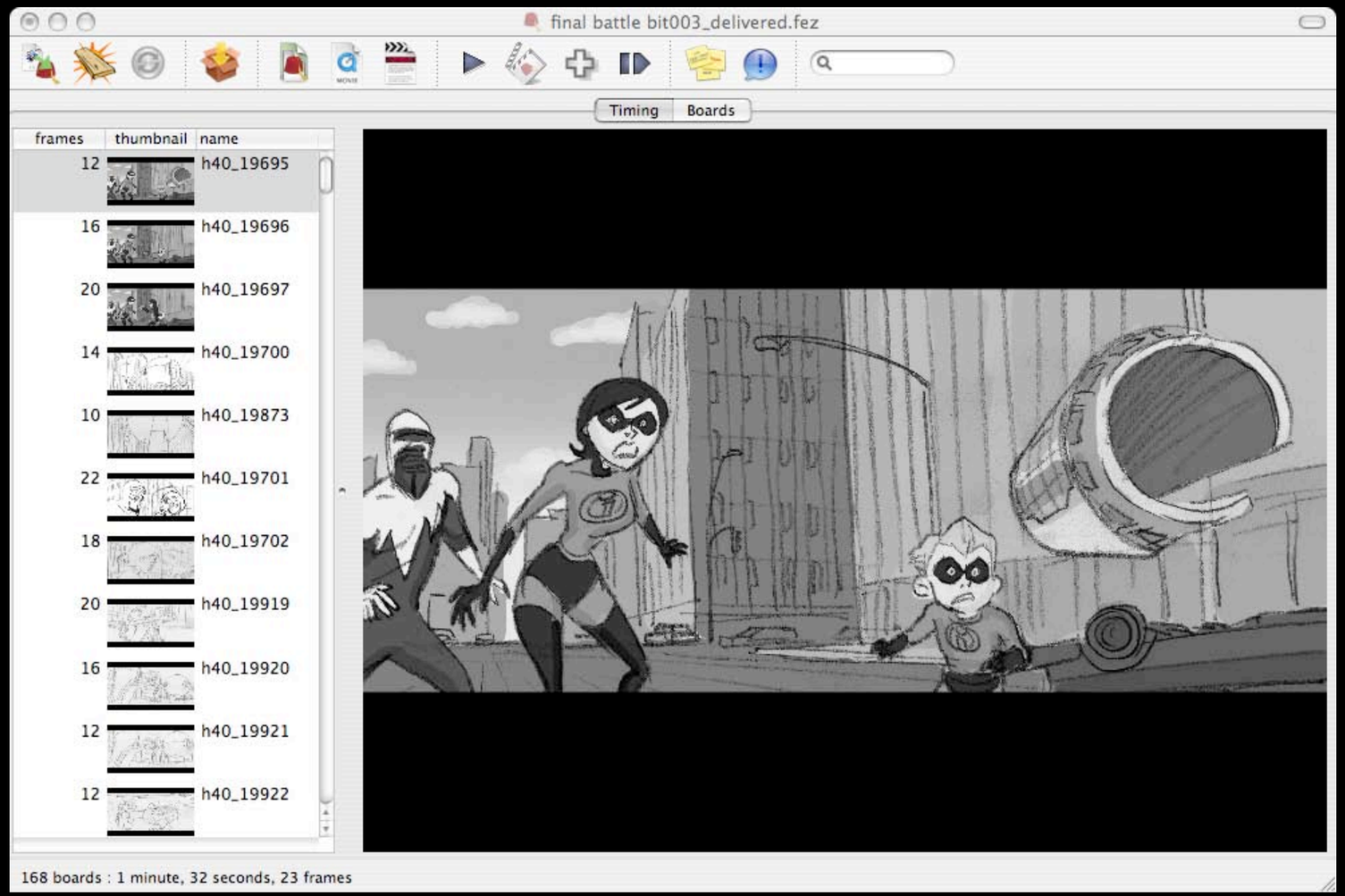
http://developer.apple.com/wwdc2005/

Pitch Docter—Circa 2002

- Developed on a dare
- Written simply and fast
- Two engineers/six months
- Lots of happy users

Pitching the Final Battle

Mark Andrews, head of story on The Incredibles, pitching part of the final battle



Pitch Docter—Three Years Later

Lessons learned

- Users loved the scalpel-like simplicity, but wanted more power
  - Longer pitches
  - Frame accurate pitches
  - Sounds attached to boards
  - Faster load times
  - Ability to play QuickTime movies from Editorial department

Pitch Docter—Three Years Later

- Sounds like QuickTime is the answer, but
  - QuickTime is too hard to learn
  - We can’t make that kind of up front investment
  - We’re Cocoa programmers

Pitch Docter + QTKit = Pitch Docter 2

- QTKit to the rescue
  - Allowed us to gain access to the power of QuickTime
  - And remain Cocoa programmers
- Allowed us to take Pitch Docter to a new level
  - Two programmers/six months
  - Expecting lots of happy users (it will be done next month)

Demo

Pitch Docter 2

http://developer.apple.com/wwdc2005/

To Learn More…

Special Session: Cartoons and Code	Lunch Talk Friday 12:45PM

QuickTime 7

http://developer.apple.com/wwdc2005/

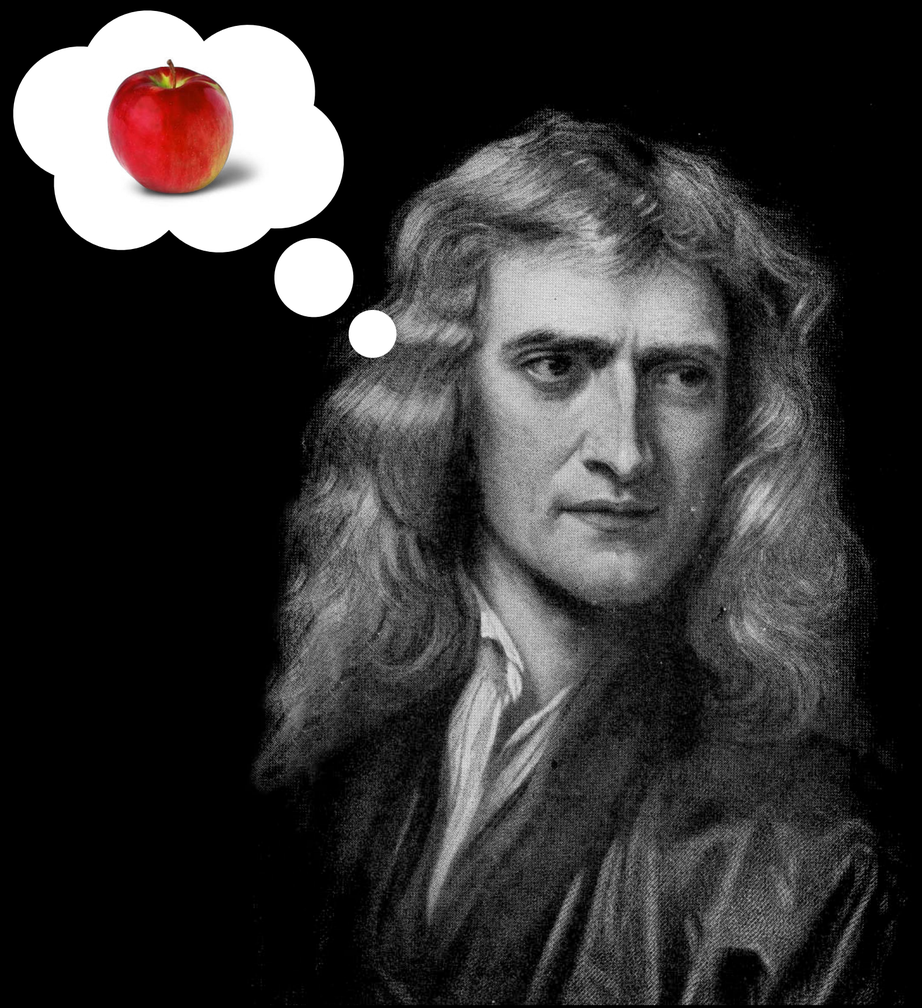
Technology Advances in Tiger

Peter Graffagnino

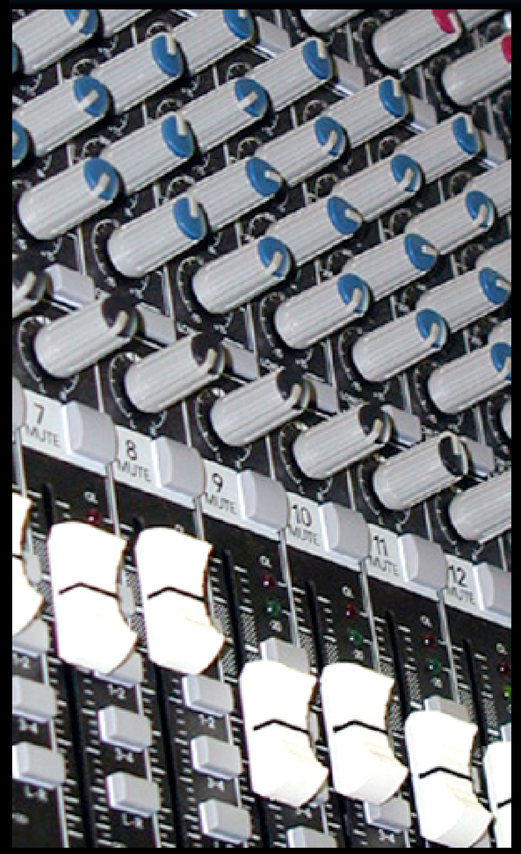
http://developer.apple.com/wwdc2005/

Our Goal…

- Make it possible to create applications that surprise, delight and inspire your users
- Shorten the distance between your “ideas” and your “code”



Our Plan: Professional-Grade Technology

Audio	2D	3D	Imaging	Video
				
Pro-grade audio technology	The ultimate 2D graphics platform	Hardware-accelerated 3D graphics	State-of-the-art image processing	Leading the revolution in digital media

Core Audio

- Professional-grade audio platform
  - Floating point
  - Multichannel
- Low latency
- Aggregate devices
- Apple Core Audio Format (CAF)

Audio Units

- Platform-wide format
  - DSP plug-ins
  - Instrument plug-ins
- Supported by premier audio apps
- Hundreds of effects available
- Licensing program
  - http://developer.apple.com/softwarelicensing/

Audio Units

AU Lab

- Visual Developer Tool for exploring Core Audio
- Test harness for Audio Units
  - Custom or generic UI
- Live mixing and playback

Audio Units

OpenAL

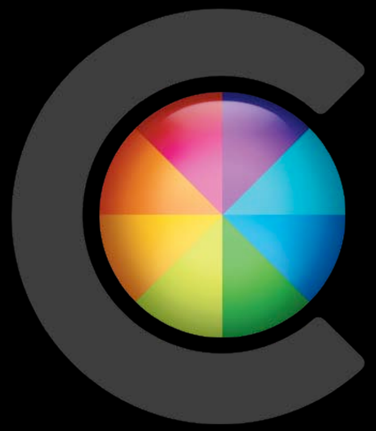
- Powerful API for 3D immersive audio
  - Cross platform
    - Mac OS X, Linux, Windows, consoles
- Supports multiple speakers for surround sound
- Built on Core Audio

Audio Sessions

Developing and Using Audio Units	Session 203 Tuesday 2:00PM
3D Environmental Audio with OpenAL	Session 205 Tuesday 3:30PM

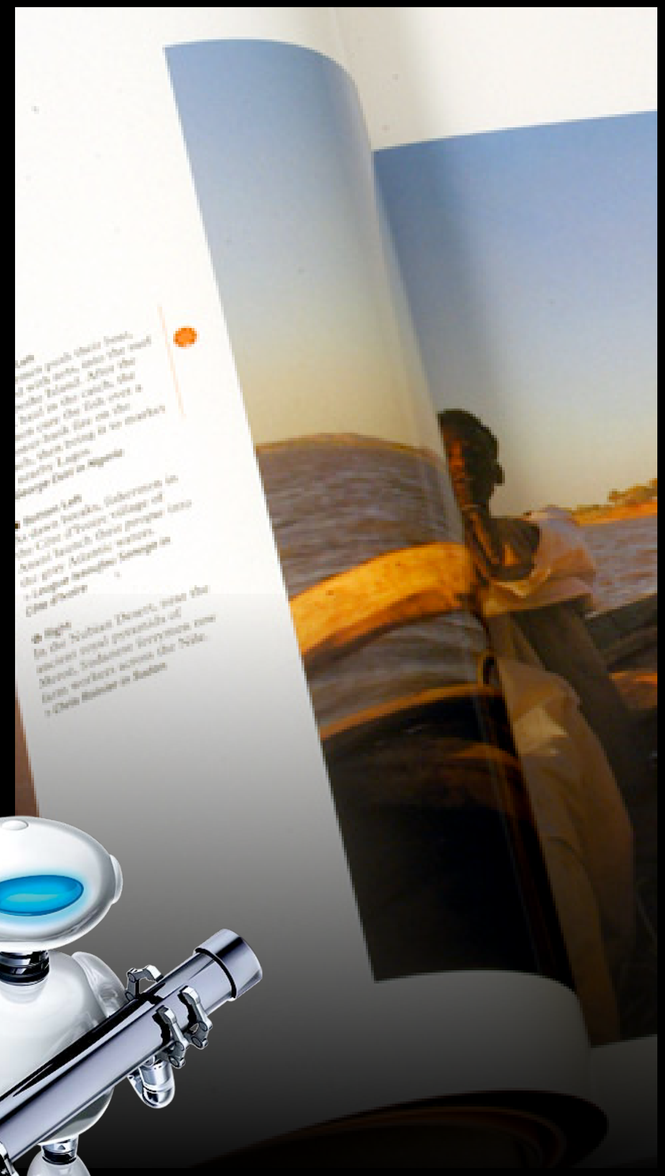
Quartz 2D and PDF

- Professional 2D drawing model
- Basis for printing on Mac OS X
- Integration with ColorSync
- Integration with Core Image



Quartz Tools

- Quartz Debug
  - Optimize your drawing
- ColorSync Utility
  - Advanced color management
  - Profile visualization
- Automator
  - Built-in set of PDF Actions



2D Graphics Sessions

Printing Best Practices for your Application	Session 212 Thursday 9:00AM
Harnessing the Power of PDF	Session 211 Thursday 10:30AM
Moving from QuickDraw to Quartz 2D	Session 215 Friday 9:00AM
Optimal 2D Application Graphics	Session 216 Friday 10:30AM

“Retro” vs “Metro”

http://developer.apple.com/wwdc2005/

"[Metro Documents] address the requirements that information workers have for distributing, archiving, rendering, and processing documents…"[Metro Documents] can be unambiguously reproduced or printed from the format in which they are saved, without tying client devices or applications to specific operating systems or service libraries."

"Metro Specification and Reference Guide v.07", Microsoft, 2005

“What industries badly need is a universal way to communicate documents across a wide variety of machine configurations, operating systems and communication networks. If this problem can be solved, then the fundamental way people work will change.“

“The Camelot Project” (aka PDF) memo, John Warnock 1991

Document Interchange Is a Solved Problem

Apple, 2000

- Realized the limitations of QuickDraw
- Wanted to build a robust format for paginated documents into the OS
- Adopted the industry standard: PDF

Microsoft, 2006

- Realizes the limitations of GDI
- Wants to build a robust format for paginated documents into the OS
- Invents their own (!?)

Enjoy the benefits of Metro, today! (even if you're still running 10.0!!!)

Sidebar: Innovation vs. Reinvention

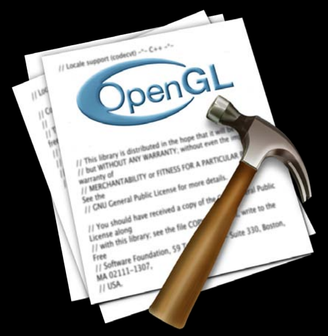
- There's little innovation in revisiting problems with well-accepted solutions
- There's a limited amount of creative energy in the world
- We've got better things to do. . .

OpenGL

- Industry-leading API for 3D and visualization
- Built in to the OS at a fundamental level
  - Quartz Extreme
  - Core Image
  - QuickTime
- New for Tiger
  - GLSL
  - Performance optimizations

OpenGL Tools

- Only on Mac OS X
- OpenGL Profiler
- OpenGL Driver Monitor
- OpenGL Shader Builder



3D Graphics Sessions

Develop and Deliver Great Mac OS X Games	Session 206 Wednesday 9:00AM
Maximizing OpenGL Performance	Session 214 Thursday 2:00PM

Core Image

- Floating-point image processing framework
- Based on stream computing paradigm
- Leverages GPU or multiple CPUs
- Kernels expressed in runtime-compiled language
- Very approachable

Image Units

- Extensible image processing modules
- Hosted in Motion 2
- Licensing program
  - http://developer.apple.com/softwarelicensing/

Image Units

Image IO

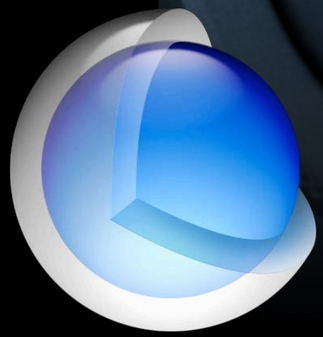
- Universal image read and write
- Wide variety of formats
- Platform-optimized
- Metadata
- Incremental loading
- Floating-point HDR formats, camera RAW

Mac OS X Color Image Management Explained

Session 209
Wednesday 2:00PM

Core Image Tools

- Core Image Fun House
- Explore the built-in Image Units
- See your custom Image Unit in action
- Quartz Composer
  - Includes real-time CI kernel development



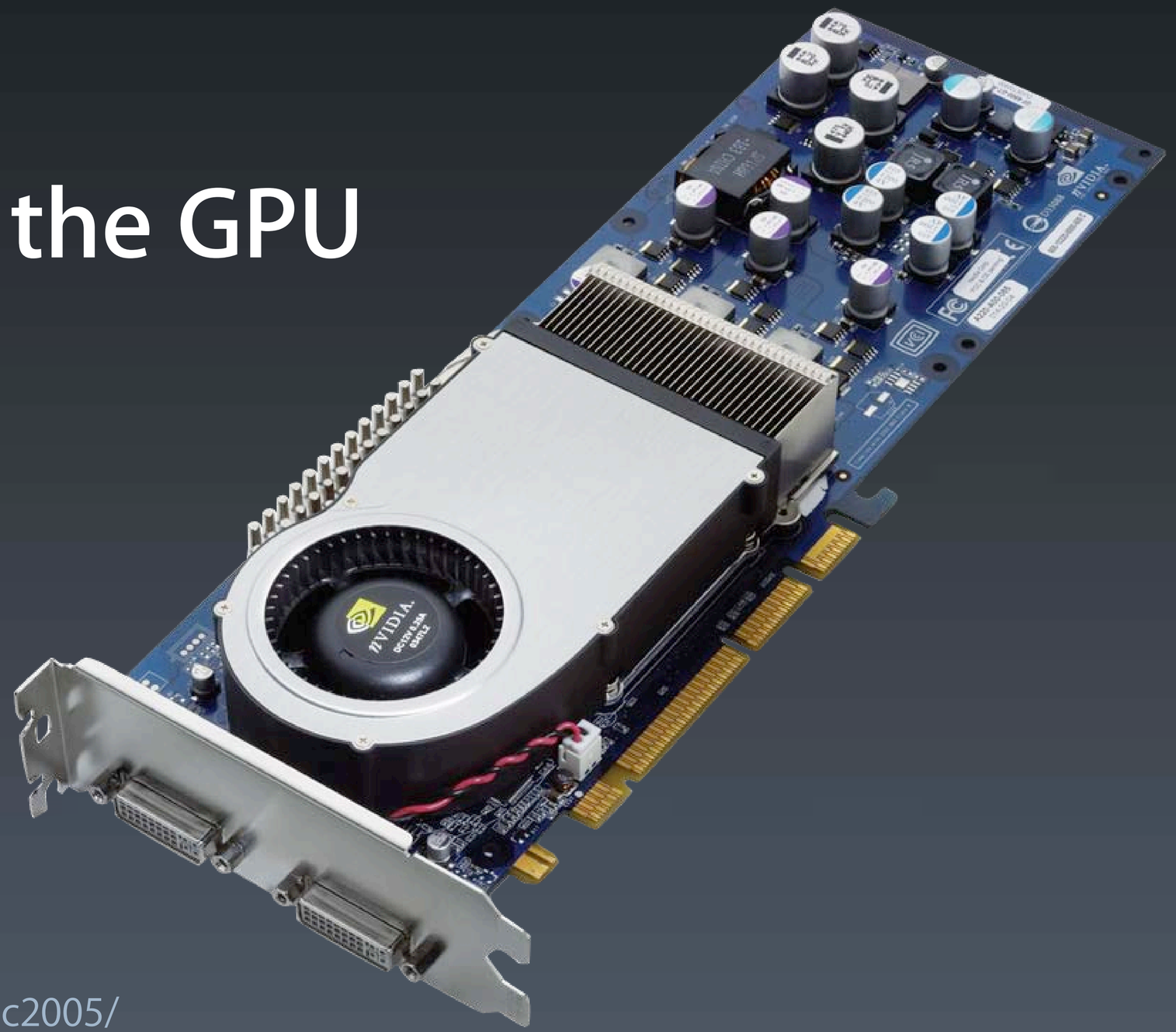
Imaging Sessions

Core Image	Session 202 Tuesday 10:30AM
Mac OS X Color Image Management Explained	Session 209 Wednesday 2:00PM
Essential Ingredients for Mac OS X Imaging Solutions	Session 210 Wednesday 3:30PM

Core Video

- Optimized architecture for video on a texture
- Data flow and synchronization between CPU and GPU
- Synchronizes display with monitor refresh
- Forms the basis of QuickTime 7's new video pipeline

The Power of the GPU

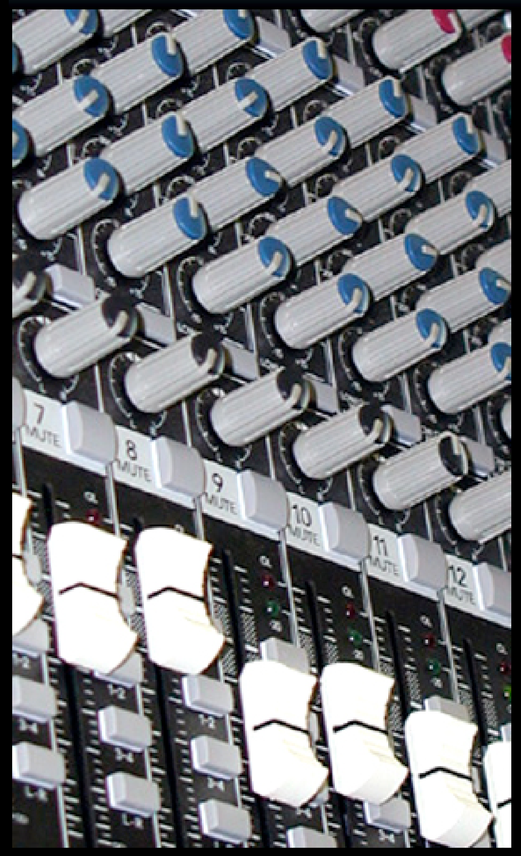


http://developer.apple.com/wwdc2005/

Sidebar: Cutting Edge vs. Trailing Edge

- Industry is moving quickly — evolve or die
- Caveat: Be careful when running with sharp objects
- Examples
  - Quartz 2D Extreme
  - Subtle GPU differences
- Don’t be afraid to take a few nicks in the name of progress!

Mac OS X Graphics and Media

Audio	2D	3D	Imaging	Video
				
Pro-grade audio technology	The ultimate 2D graphics platform	Hardware-accelerated 3D graphics	State-of-the-art image processing	Leading the revolution in digital media

Quartz Composer

- Framework for real-time motion graphics visualizations
- Composition files combine the power of Tiger's core technologies
- Graphical editor for compositions
- Supported by QuickTime on Tiger
- Easy to integrate into your applications

Demo

Quartz Composer

http://developer.apple.com/wwdc2005/

Grand Finale Demo

Running with sharp objects

- Demonstrate all audiovisual technologies working together
  - Core Audio
  - Core MIDI
  - Core Video
  - Core Image
  - OpenGL
- Concept
  - Use Quartz Composer to augment live DJ performance
    - Parameterized visuals—no rendering required
- Enables new realtime creation and performance possibilities

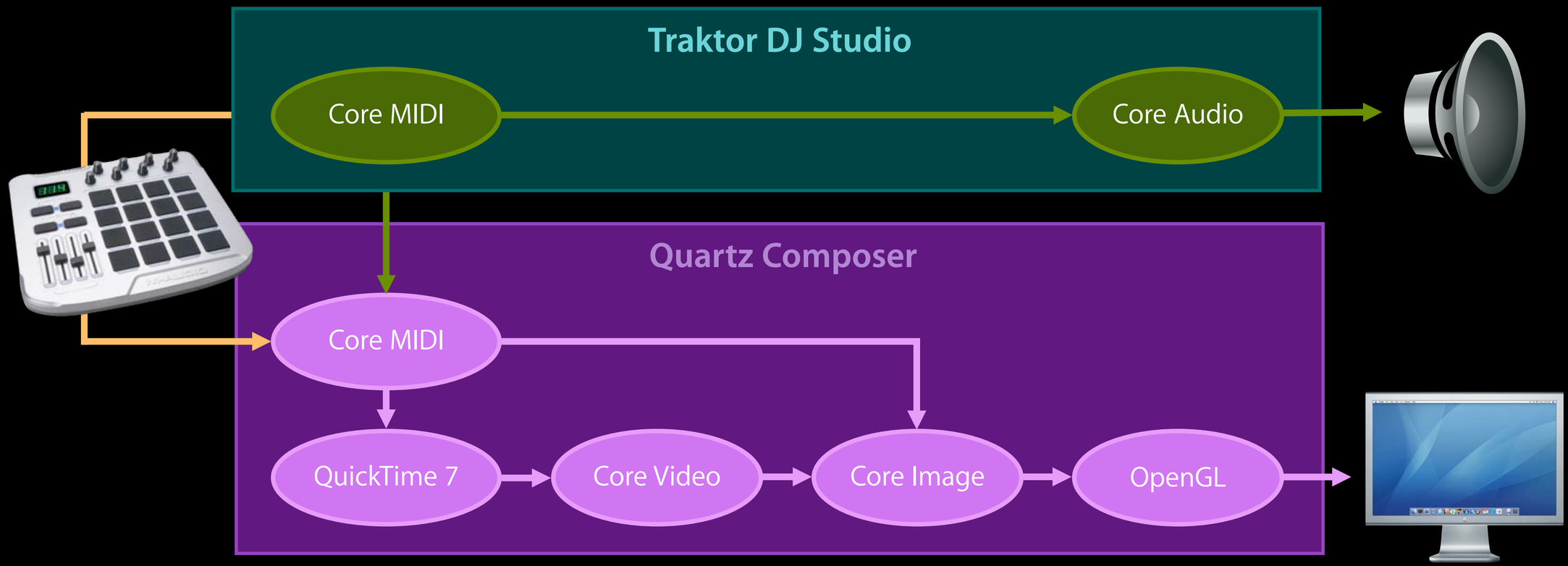
Demo

DJ/VJ

Ean Golden
San Francisco DJ and Producer
http://www.eangolden.com/

http://developer.apple.com/wwdc2005/

DJ/VJ Demo Explained



Utilizing Quartz Composer in your Application

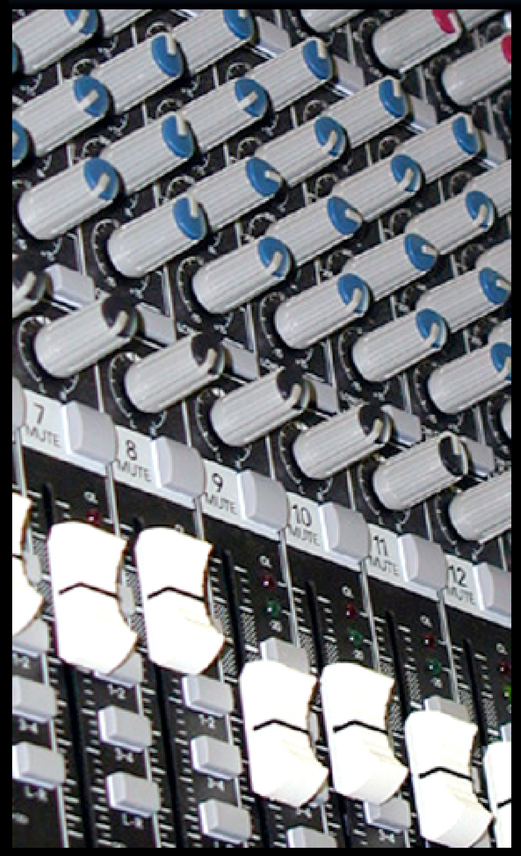
Session 204
Tuesday 2:00PM

Wrap-Up

Tim Schaaff

http://developer.apple.com/wwdc2005/

Mac OS X Graphics and Media

Audio	2D	3D	Imaging	Video
				
Pro-grade audio technology	The ultimate 2D graphics platform	Hardware-accelerated 3D graphics	State-of-the-art image processing	Leading the revolution in digital media

But That's Not All…

MIDI via RTP • AUNetSend • AU Lab • CAF • AudioFile API • Constrained VBR AAC • TimePitchAU • OpenAL • VBR Device Support • Aggregate Device Support • Spotlight Support • PDF Annotation Display • PDF Forms Support • PDF Kit • Image Correction • Slide Show • > 2GB File Support • PDF 1.5 • PDF Stream Parsing • Encrypted PDF • Link and Anchor Creation • Image IO • OpenEXR • Camera RAW • DNG • Wireless Device Browser • Automatic Projector Display • OpenGL Shading Language • Virtualized RAM Support • Performance Optimizations • Fax Archives and Logs • IPv6 Support • Bonjour Discovery of Shared Printers • Deep Pixel Printing • FireWire Printing • Printer Supplies Notification • Core Image • Fun House • Image Units • Quartz Composer • RSS Screen Saver • H.264 • QTKit • Core Video Support • Core Audio Support • Multichannel Audio • Automatic Bandwidth Detection • Interface Builder Support • Cocoa-based Player • Color Correction • Cocoa browser plug-in

Feedback Forums

Graphics and Media Feedback Forum	Session 217 Friday 2:00PM
QuickTime Feedback Forum	Session 218 Friday 3:30PM

Mac OS X Tiger

WWDC2005

Worldwide Developers Conference